Work Assignment No. 6
MTA Agreement No. 15099-0300

Utica Avenue Transit Improvements Study

Task 1 Deliverables 3-5: Model Validation, Land Use Scenarios & Demand Forecasts

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1 Executive Summary

This report is the culmination of the Task 1 work in the Utica Ave Study and includes documentation of current and future baseline demand. The report summarizes the methodology and results of the travel demand model validation, the definition of three Land Use Scenarios, and the corresponding No-Build ridership forecasts for each Land Use Scenario. The discussion of current demand is based on the results of the travel demand model validation for the 2015 Base year, and builds upon the documentation included in a separate Task 1 deliverable that focused on the methodology and results of the Transportation Intercept Survey.[1]

As discussed in this report, the future baseline demand reflected a No-Build Alternative defined to include a number of transportation network improvements that will be in place in the 2035 horizon year for this study. This includes Long Island Rail Road (LIRR) East Side Access, Metro-North Railroad Penn Station Access, and Phase 2 of the Second Avenue Subway. The No-Build Alternative also incorporated the installation of Communications-Based Train Control (CBTC) on the A-Division of the subway system.

In addition to the transportation network improvements, the future baseline demand accounted for three different Land Use Scenarios defined in collaboration with the New York City Department of City Planning (DCP). As such, three different No-Build demand forecasts are presented in this report.

DCP started the process of defining three possible Land Use Scenarios that assumed improved transit access along the Utica Ave corridor.[2] The Study Team supported DCP in translating the scenarios into socioeconomic and demographic (SED) data inputs for the ridership model for purposes of the demand forecasts, focusing on the key model inputs of household population and total employment. The SED data for Land Use Scenario 1 was pre-defined and based on the adopted 2035 SED projections from the New York Metropolitan Transportation Council (NYMTC). The Study Team subsequently developed an approach for projecting SED inputs for Land Use Scenarios 2 and 3 in coordination with DCP.

[redacted]

[1] Refer to "Task 1 Deliverable 2: Transportation Intercept Survey" for additional details.

[2] As noted by DCP during the study, it is important to stress that the three Land Use Scenarios were hypothetical and contingent upon transit improvements. Since the No-Build Alternative included improvements to the existing B46 Select Bus Service (SBS) (as summarized in this report), all three Land Use Scenarios would be accompanied by transit improvements along Utica Ave regardless of the outcome of this study. The extent of the transit improvements would vary when comparing the No-Build Alternative to the different Build Alternatives under consideration, as discussed in subsequent task deliverables.

Subsequent work in the Utica Ave Study built upon the documentation in this report. Specifically, the validated model was used to generate ridership forecasts for a range of Build Alternatives for the Utica Ave transit improvements, and the No-Build forecasts included herein served as the point of comparison. Indeed, one of the foundational goals of this study was to improve mobility and connectivity through the provision of new or enhanced transit options (in addition to evaluating opportunities to increase capacity in the existing subway network), and with ridership as a key evaluation criterion, the No-Build forecasts in this report effectively established the baseline against which to assess the relative benefits of different transit improvement options along Utica Ave.

2 Introduction

This technical memorandum is the culmination of the Task 1 work in the Utica Ave Study. The purpose of this report is to document current and future baseline demand as a precursor to forecasting ridership for a number of transit improvement alternatives in a subsequent task. The discussion of current demand is based on the results of the travel demand model validation for the 2015 Base year, and builds upon the documentation included in a separate Task 1 deliverable that focused on the methodology and results of the Transportation Intercept Survey.[3] As discussed in this report, the future baseline demand reflected a No-Build Alternative defined to include a number of transportation network improvements that will be in place in the 2035 horizon year for this study, as well as three different Land Use Scenarios defined in collaboration with the New York City Department of City Planning (DCP). As such, three different No-Build demand forecasts are presented in this report and served as the baseline against which to evaluate the ridership potential of the Build Alternatives in this study.

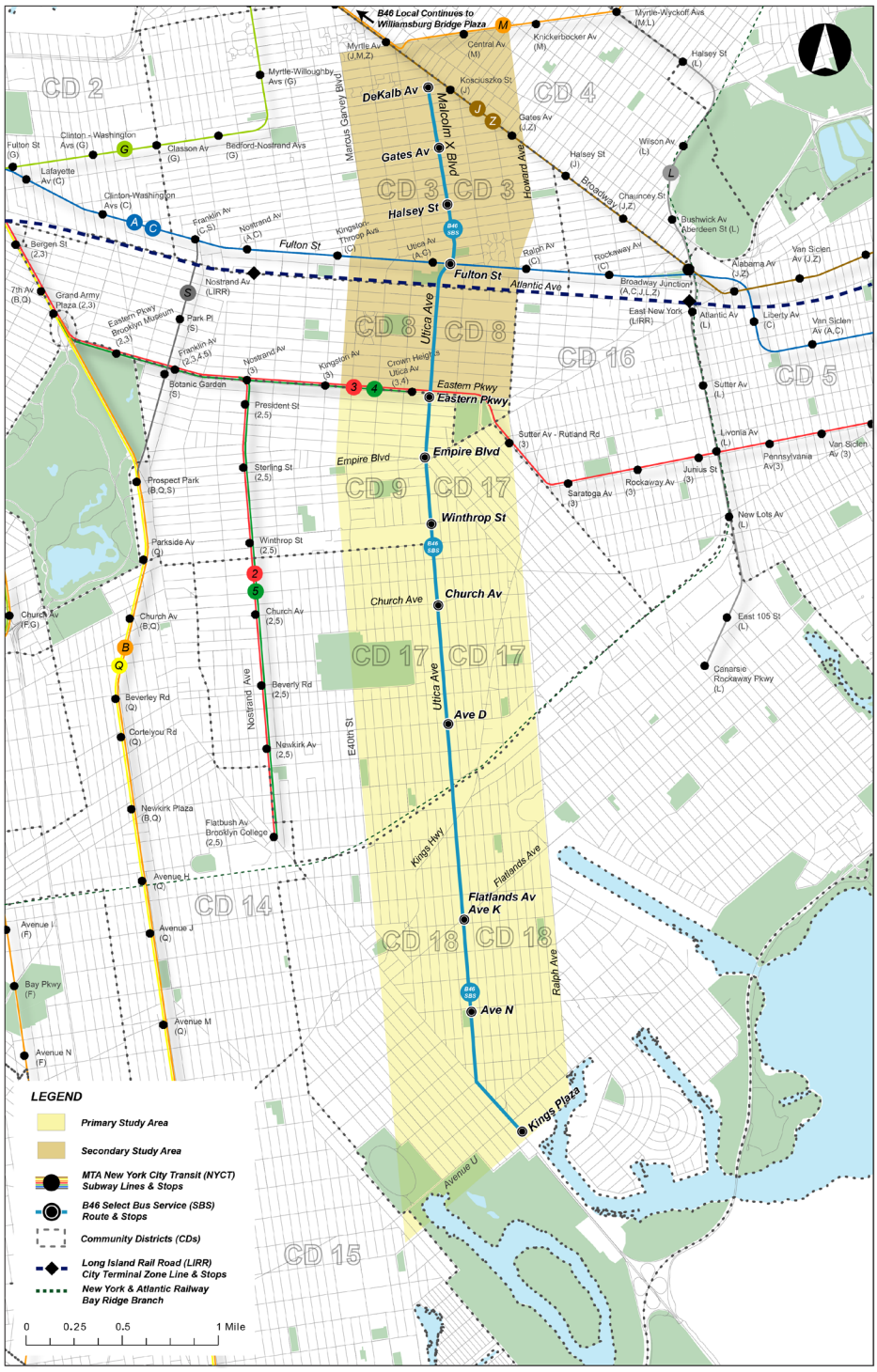
3 Study Area

As shown on Figure 1, the Study Area for the Utica Ave Study extends from Avenue V in the south to Myrtle Ave in the north, incorporating an approximately half-mile buffer around the Utica Ave corridor (which becomes Malcolm X Boulevard north of Fulton Street).[4] As noted in subsequent sections of this report, the Study Area boundaries were modified midway through the study. When the travel demand model validation was started, the northern boundary of the Study Area was defined as Fulton Street, and thus the validation results (and summary of current demand) as presented in this report reflect that definition of the Study Area. The northern boundary of the Study Area was subsequently extended northward to Myrtle Ave (i.e., several blocks north of the terminus for the existing B46 Select Bus Service [SBS]), and this updated definition of the Study Area is reflected in the tabulation of the No-Build ridership forecasts.

[3] Refer to "Task 1 Deliverable 2: Transportation Intercept Survey" for additional details.

[4] The Study Area is divided into Primary and Secondary Study Areas. The Primary Study Area is bounded by Eastern Parkway to the north, Ralph Ave to the east, Avenue V to the south, and East 40th Street to the west. This area serves as the main focus in the study of options to improve transit service and mobility along the Utica Ave corridor. A Secondary Study Area contains additional opportunities for transit improvements along the northern portion of the corridor, extending from the Primary Study Area's northern boundary to Myrtle Ave.

Figure 1: Utica Ave Study Area



Source: Utica Ave Study

4 Overview of Travel Demand Forecasting Methodology

Two forecasting models were used for the Utica Ave Study:

- The **Best Practices Model (BPM)**, a regional travel demand model developed by the New York Metropolitan Transportation Council (NYMTC), was used to forecast changes in travel volumes and patterns within the region due to future changes in population, employment and a number of key socioeconomic factors, as well as major changes in the transportation network.
- The Metropolitan Transportation Authority's (MTA) **Regional Transit Forecasting Model (RTFM)** was used to project changes in transit ridership (bus, subway, etc.) due to new services or changes to existing operations.

The building blocks of the BPM and RTFM are Transportation Analysis Zones (TAZs), which generally map Census Tracts and correspond to the smallest area for socioeconomic and demographic (SED) projections. The BPM used SED data as an input to generate trips, which were assigned among thousands of TAZs in the region. The RTFM used the trips from BPM, reflected transit service changes, and projected mode split, assigned to modes and routes, and projected ridership.

Figure 2 summarizes the travel demand forecasting methodology, in which the output of BPM was used as an input to RTFM.

Figure 2: Travel Demand Forecasting Methodology

Source: Utica Ave Study

5 Model Validation & Current Demand

As a precursor to documenting the current demand for the 2015 Base year, the Study Team validated the RTFM by comparing the model's 2015 trip volumes, mode choice, and network assignments to other sources of data. Below is an overview of the model validation process, followed by a summary of current demand using the validated model.

5.1 MODEL VALIDATION

5.1.1 Validation Data

The validation process made use of several sources of data. The Transportation Intercept Survey, conducted as a part of this study and reported separately,[5] captured data on travelers in the Utica Ave corridor, including travel modes, routes taken, travel times, purposes, times of day, and destinations. The Intercept Survey data was combined with other data sources, including:

- Bus boardings based on NYCT's "MetroCard Model";
- Subway station-to-station estimates from MetroCard 'swipe' data;
- Volumes across designated screenlines; and
- Scheduled and observed runtimes.

5.1.2 Summary of Validation Process

The travel demand model analyzed AM peak period (6:00 to 10:00) travel, and for validation, focused on travel in the Utica Ave corridor on the B46 Local, B46 SBS, and commuter van services.

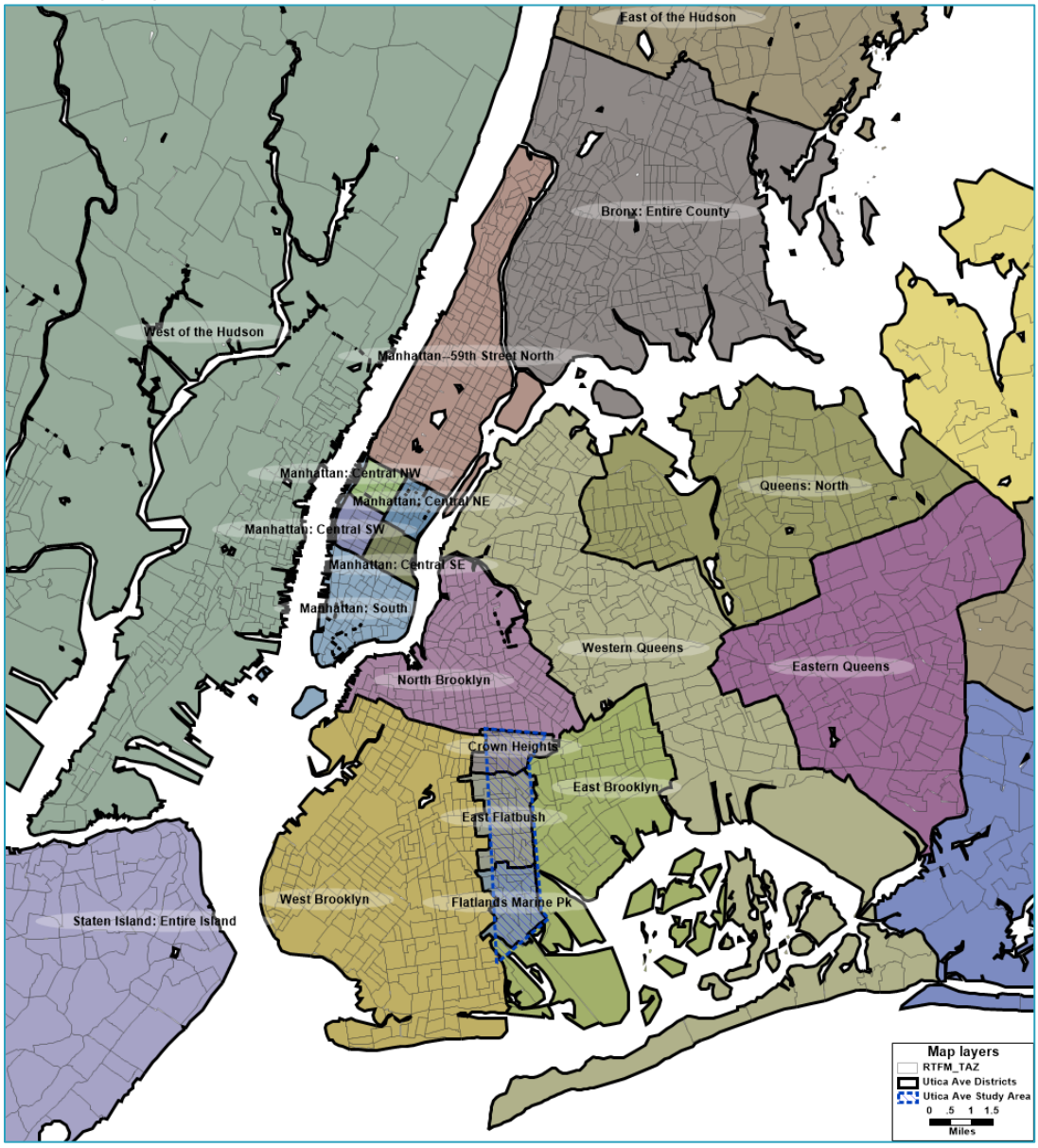
The first step in the validation process was to update the model network. B46 Local service was modified to reflect two patterns (i.e., Avenue N to Eastern Parkway, and Avenue U to Williamsburg Bridge Plaza). Additionally, the previously operating B46 Limited Bus service was replaced with the B46 SBS. A proxy transit service was also added to represent the independently operated commuter van service. Subway headways and runtimes on the 2, 3, 4, 5, A, and C lines were modified to match current schedules, and Phase 1 of the Second Avenue Subway was added.

The validation process involved iterative model runs, review of results, and modifications of model parameters. Results that were reviewed included boardings, transfers, travel volumes across key transit screenlines, and transit trips to and from key "SuperZones," corresponding to a set of aggregated TAZs. During the model validation process, TAZs in the model region were aggregated into a set of 26 SuperZones (Figure 3) for analysis and reporting, and three SuperZones were defined to encompass the Study Area (as it was originally defined)[6] and proximate TAZs, as follows:

- Flatlands Marine Park: from Marine Park to Ave H;
- East Flatbush: from Ave H to Empire Blvd; and
- Crown Heights: from Empire Blvd to Fulton St.

[5] Refer to "Task 1 Deliverable 2: Transportation Intercept Survey" for additional details.
[6] As discussed in Section 7, an additional SuperZone (i.e., Stuyvesant Heights - from north of Fulton St to Myrtle Ave) was later added to reflect the updated boundaries of the Study Area and for analysis of No-Build (and subsequently Build) scenarios.

Figure 3: Map of SuperZones Used in Model Validation



Source: Utica Ave Study

5.1.3 Validation Adjustments

Initial validation runs indicated that the model was over-estimating boardings on buses and commuter vans by more than 55% (i.e., 22,000 estimated vs. 14,000 based on the NYCT "MetroCard Model"). Additionally, comparisons of screenline volumes and transfer volumes indicated a need for adjustments. Incremental and iterative adjustments were tested, and changes to the following parameters were finalized in this order:

- Adjusted the mode choice constant for East Brooklyn and Study Area SuperZones to and from all Brooklyn zones;
- Adjusted mode choice constant for Brooklyn and Queens to Manhattan to increase subway trips and improve validation of peak hour subway screenlines;
- Implemented bus runtime penalties (reflected in differences in scheduled versus observed runtimes);[7]
- Added a penalty to discourage transfers between the southbound B46 Local and B46 SBS; and
- Changed transfer wait time parameters at the Crown Heights-Utica Av subway station (at Eastern Parkway) and the Utica Av subway station (at Fulton Street) to encourage transfers from the B46 Local southbound.

5.2 VALIDATION RESULTS AND CURRENT DEMAND

After reaching reasonably valid results as agreed upon with NYCT, the model outputs for the 2015 Base year provided the basis for describing the 2015 current demand as a precursor to forecasting 2035 No-Build ridership. The following tables report AM Peak Period modeled transit trips using the validated model for the 2015 Base year. Additionally, comparisons between the validated model outputs and NYCT's "MetroCard Model" are included in Appendix 1.

As previously noted, the model validation focused on travel in the Utica Ave corridor on the B46 Local, B46 SBS, and commuter van services. These three services are hereafter referred to as "Corridor Transit Services," and the corresponding trips that used these services are collectively referred to as "Corridor Transit Trips." Overall, the Corridor Transit Services carried 14,570 customers during the AM Peak Period on an average weekday (Table 1). These routes primarily served trips with origins and destinations in Brooklyn (68%), and another 20% of these trips were headed to/from Manhattan.

[7] A bus runtime penalty of 14% was applied to the B46 SBS as part of the model validation process, such that the scheduled runtimes were multiplied by a factor of 1.14 for each direction. The resultant "modified runtimes" were also applied in the No-Build Alternative for the B46 SBS as well as the Build Alternatives (in a subsequent task) for the new transit service options under consideration in the study.

Table 1: One-Way Corridor Transit Trips Between Boroughs (AM Peak Period) – 2015 Base Year

To and From	To and From	Modeled Trips	Percentage of Total Modeled Trips
Brooklyn	Brooklyn	9,883	68%
Brooklyn	Queens	1,081	7%
Brooklyn	Manhattan	2,939	20%
Brooklyn	Other	667	5%
	Total	**14,570**	**100%**

Source: Utica Ave Study

Note: Sum may not add to total due to rounding

As shown in Table 2, 53% of the total Corridor Transit Trips during the AM Peak Period made use of the B46 SBS. Another 37% used the B46 Local, and the remaining 10% used the private commuter vans.

Table 2: Boardings on Corridor Transit Service (AM Peak Period) – 2015 Base Year

Service	Modeled Boardings	Percentage of Total Modeled Boardings
B46 Local*	5,414	37%
B46 SBS	7,755	53%
Commuter Van	1,401	10%
Total Corridor Transit Trips	**14,570**	**100%**

Source: Utica Ave Study

Note: Sum may not add to total due to rounding

* B46 Local boardings include all boardings for the entire route (i.e., from Avenue U to Williamsburg Bridge Plaza).

The largest share of the Corridor Transit Trips during the AM Peak Period boarded at Eastern Parkway (20% or 2,933), which was the major transfer point for trips to and from the Study Area. With that one exception, boardings were relatively evenly distributed along the corridor during the AM Peak Period, with 5% to 8% of the total boarding in each Station Group (Table 3).[8]

[8] Station Groups were anchored by the B46 SBS stops and included aggregations of B46 Local stops for purposes of reporting ridership summaries. Moving northward from Avenue U, each Station Group included the B46 SBS stop and all B46 Local bus stops northbound up to, but not including, the next B46 SBS stop.

Table 3: Station Group Boardings by Corridor Transit Service (AM Peak Period)– 2015 Base Year

Stops	Modeled B46 Local Boardings	Modeled B46 SBS Boardings	Modeled Commuter Van Boardings	Total, All Modeled Services	Percentage of Total Modeled Boardings
DeKalb Av	533	508	0	1,041	**7%**
Gates Av	98	652	0	750	**5%**
Halsey St	121	725	0	846	**6%**
Fulton St	156	1,037	0	1,193	**8%**
Eastern Pkwy	1,226	1,372	333	2,931	**20%**
Empire Blvd	370	744	21	1,135	**8%**
Winthrop St	651	197	71	919	**6%**
Church Av	522	601	91	1,214	**8%**
Avenue D	285	439	205	929	**6%**
Avenue H	402	327	370	1,098	**8%**
Flatlands Av	357	277	109	742	**5%**
Avenue N	250	579	68	897	**6%**
Avenue U	443	297	134	874	**6%**
Total	**5,414**	**7,755**	**1,401**	**14,570**	**100%**

Source: Utica Ave Study

Notes:

- Sum may not add to total due to rounding.
- Station-level boardings were furthered analyzed in a subsequent task in coordination with NYCT.

More detail on the origins and destinations of Corridor Transit Trips during the AM Peak Period can be found in Table 4, which identifies the destinations of linked trips from the Study Area SuperZones to other destinations in the region in the 2015 Base year. The table shows that 33% of all trips during the AM Peak Period (4,834 of 14,570) originated in the East Flatbush SuperZone. North Brooklyn, West Brooklyn, and Manhattan were key destinations for trips originating in East Flatbush. East Flatbush was also a key destination for trips from other origins outside of the Study Area (2,301 or 32% of all Corridor Transit Trips originating outside the Study Area during the AM Peak Period).

Table 4: SuperZone to SuperZone Origin/Destination Matrix of Linked Corridor Transit Trips (AM Peak Period) – 2015 Base Year

SuperZones	Flatlands Marine Pk	East Flatbush	Crown Heights	Stuyvesant Heights*	North Brooklyn	West Brooklyn	East Brooklyn	Queens	Manhattan: South	Manhattan: Central SW	Manhattan: Central SE	Manhattan: Central NW	Manhattan: Central NE	Manhattan--59th Street North	All Other	Total
Flatlands Marine Pk	36	226	86	-	334	364	267	112	58	14	11	27	59	99	71	**1,764**
East Flatbush	190	178	79	-	749	750	176	234	455	90	103	234	490	759	347	**4,834**
Crown Heights	112	135	4	-	311	45	49	137	1	-	-	-	-	-	9	**803**
Stuyvesant Heights*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Study Area Subtotal	**338**	**539**	**169**	**-**	**1,394**	**1,159**	**492**	**483**	**514**	**104**	**114**	**261**	**549**	**858**	**427**	**7,401**
All Other Subtotal	631	2,301	441	-	1,796	978	400	136	138	7	4	19	86	148	84	**7,169**
Total	**969**	**2,840**	**610**	**-**	**3,190**	**2,137**	**892**	**619**	**652**	**111**	**118**	**280**	**635**	**1,006**	**511**	**14,570**

Source: Utica Ave Study

Note: Sum may not add to total due to rounding

* Stuyvesant Heights was defined as a SuperZone for analysis following the model validation (consistent with the northward extension of the Study Area to Myrtle Ave as discussed in Section 3) and is reflected in the tabulation of No-Build ridership forecasts.

While Corridor Transit Services provided access to areas in Brooklyn near the Study Area, they also served the larger region by providing access to connecting subway services (Table 5). Twenty-eight percent of all Corridor Transit Trips during the AM Peak Period (4,140 of 14,570) transferred to a subway. Nearly two-thirds of all transfers during the AM Peak Period (2,588 or 63%) made the transfer at Crown Heights-Utica Av Station while traveling northbound on one of the Corridor Transit Services.

Nearly half (1,960) of the subway transfers during the AM Peak Period were from the B46 SBS, with the majority transferring in the northbound direction. Another 1,457 transfers during the AM Peak Period were northbound trips on the B46 Local that transferred to the subway at Crown Heights-Utica Av Station.

Table 5: Corridor Transit Trips Transferring to Subway (AM Peak Period) – 2015 Base Year

	Northbound Transfers			Southbound Transfers*		
	Crown Heights-Utica Av (3 4)	Utica Av (A C)	Myrtle Av/ Kosciuszko (J M Z)	Crown Heights-Utica Av (3 4)	Utica Av (A C)	Total Transfers
B46 Local	1,457	23	4	18	173	1,675
B46 SBS	626	376	124	326	508	1,960
Commuter Van	505	0	0	0	0	505
Total	**2,588**	**399**	**128**	**344**	**681**	**4,140**
						28% of 14,570 Total Linked Corridor Transit Trips

Source: Utica Ave Study

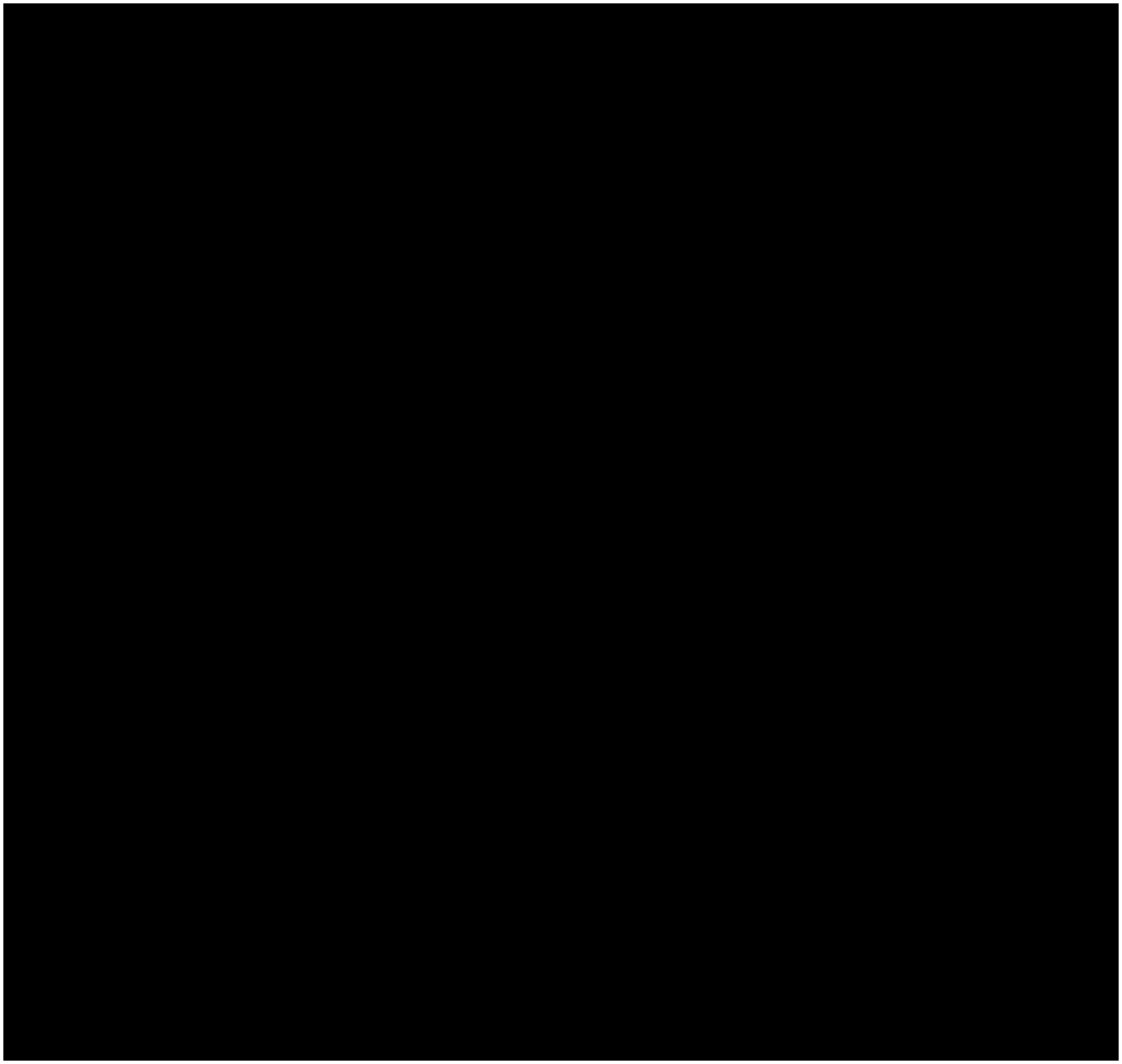
Note: Sum may not add to total due to rounding

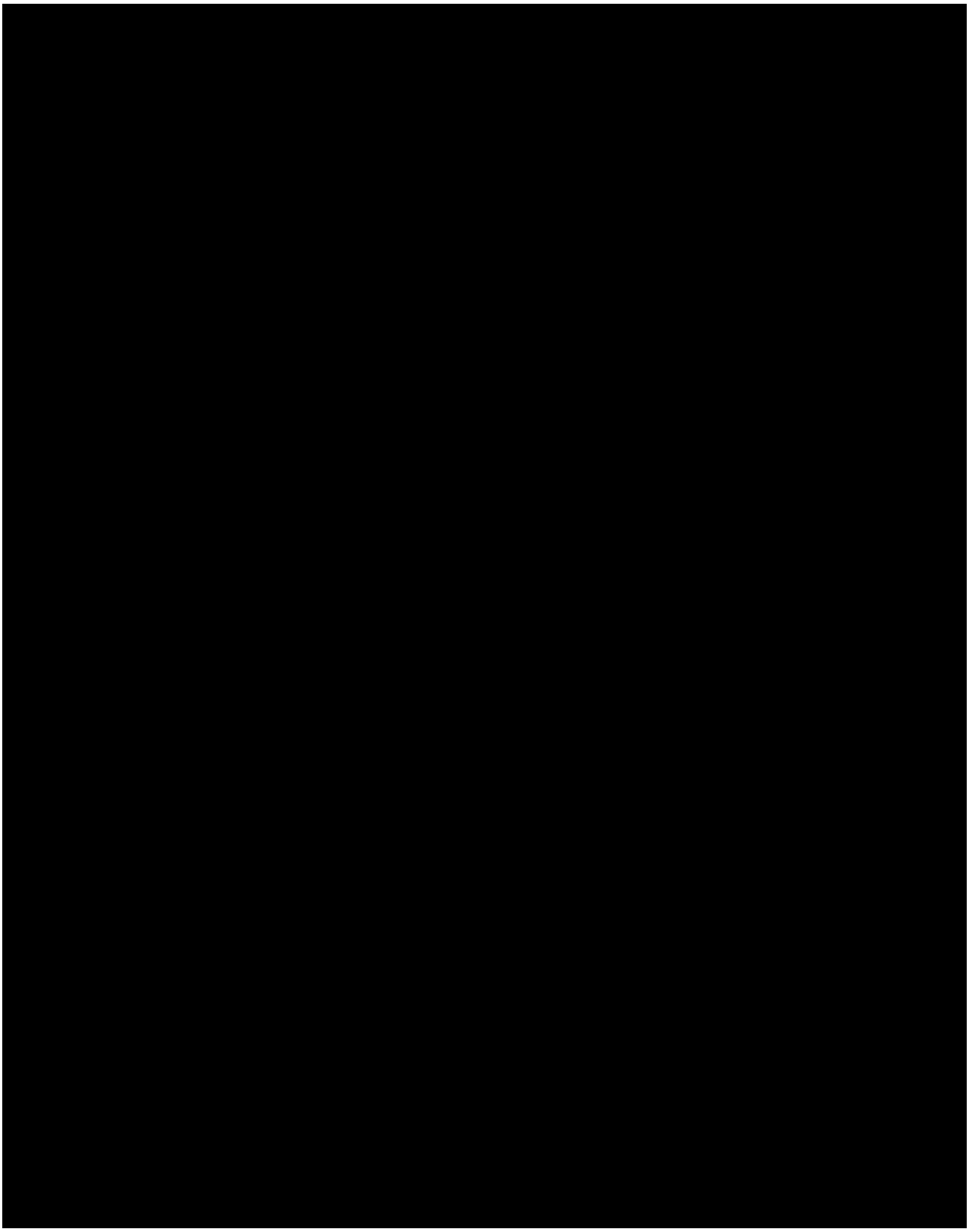
*Zero Transfers at Myrtle Av/Kosciuszko St in the Southbound direction.

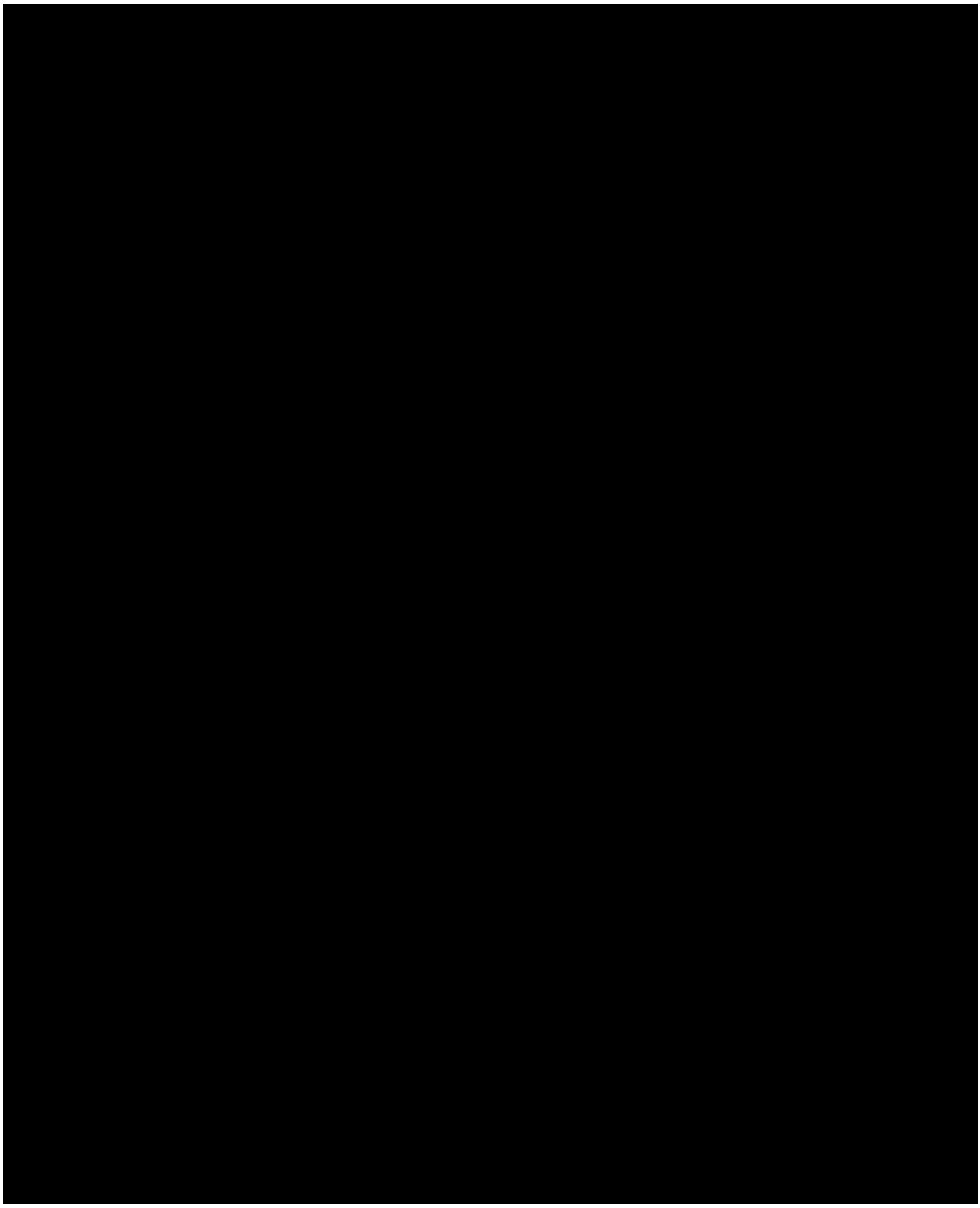
Overall, the model validation and 2015 Base year demand set the stage for the definition and evaluation of the future No-Build condition in the 2035 horizon year.

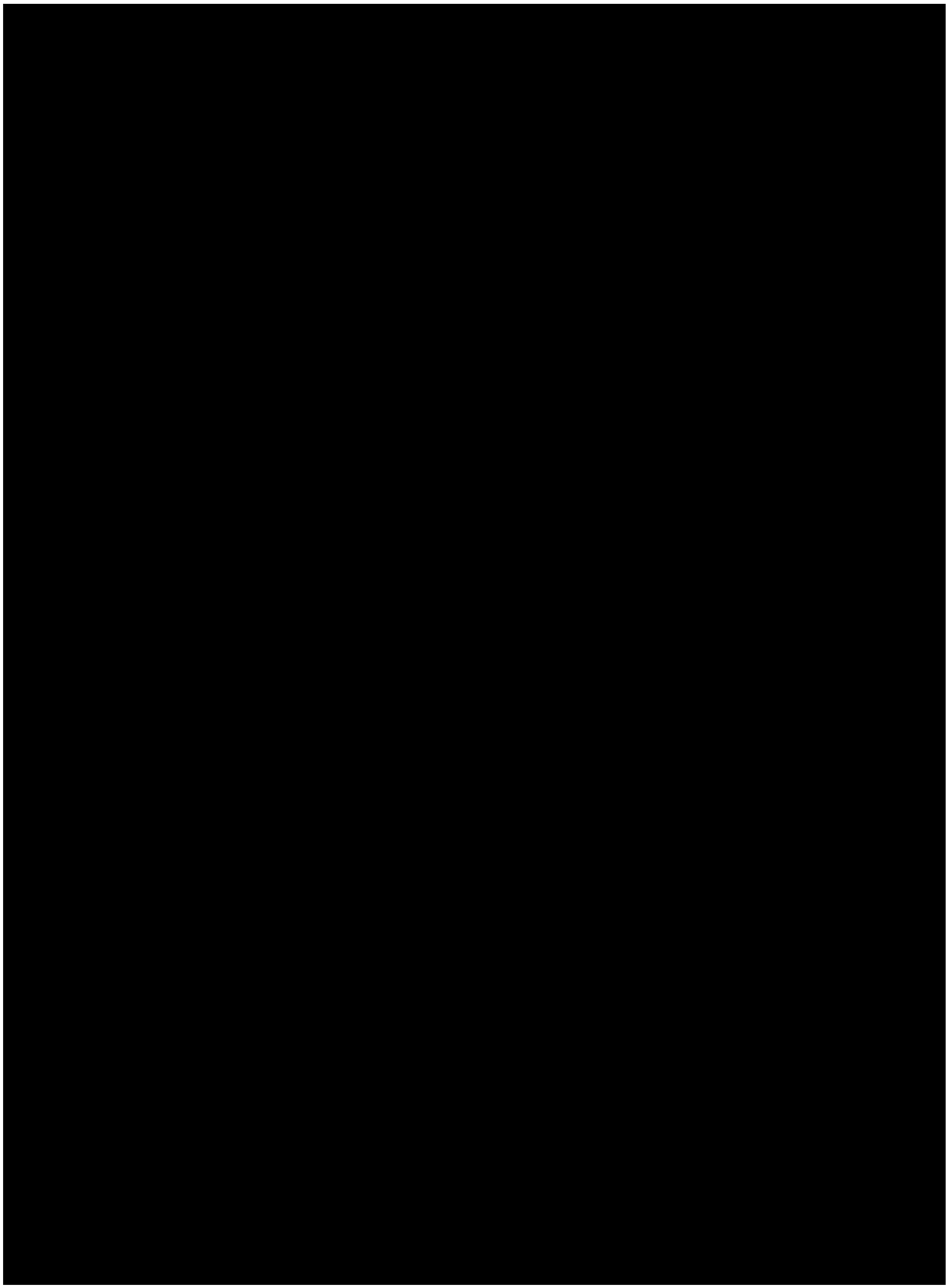
6 Definition of the No-Build Alternative & Three Land Use Scenarios

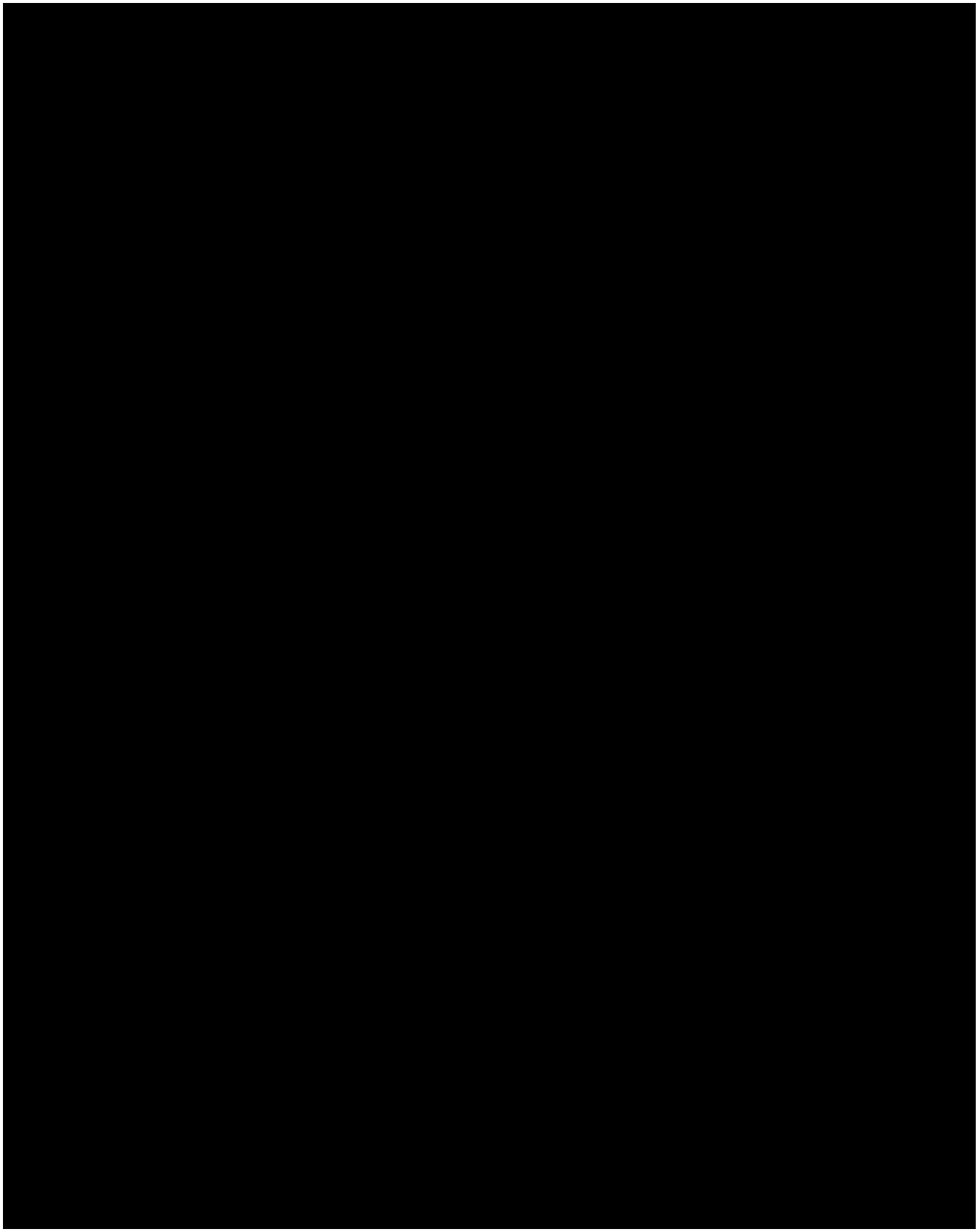
6.1 NO-BUILD ALTERNATIVE – TRANSPORTATION NETWORK ASSUMPTIONS[9]

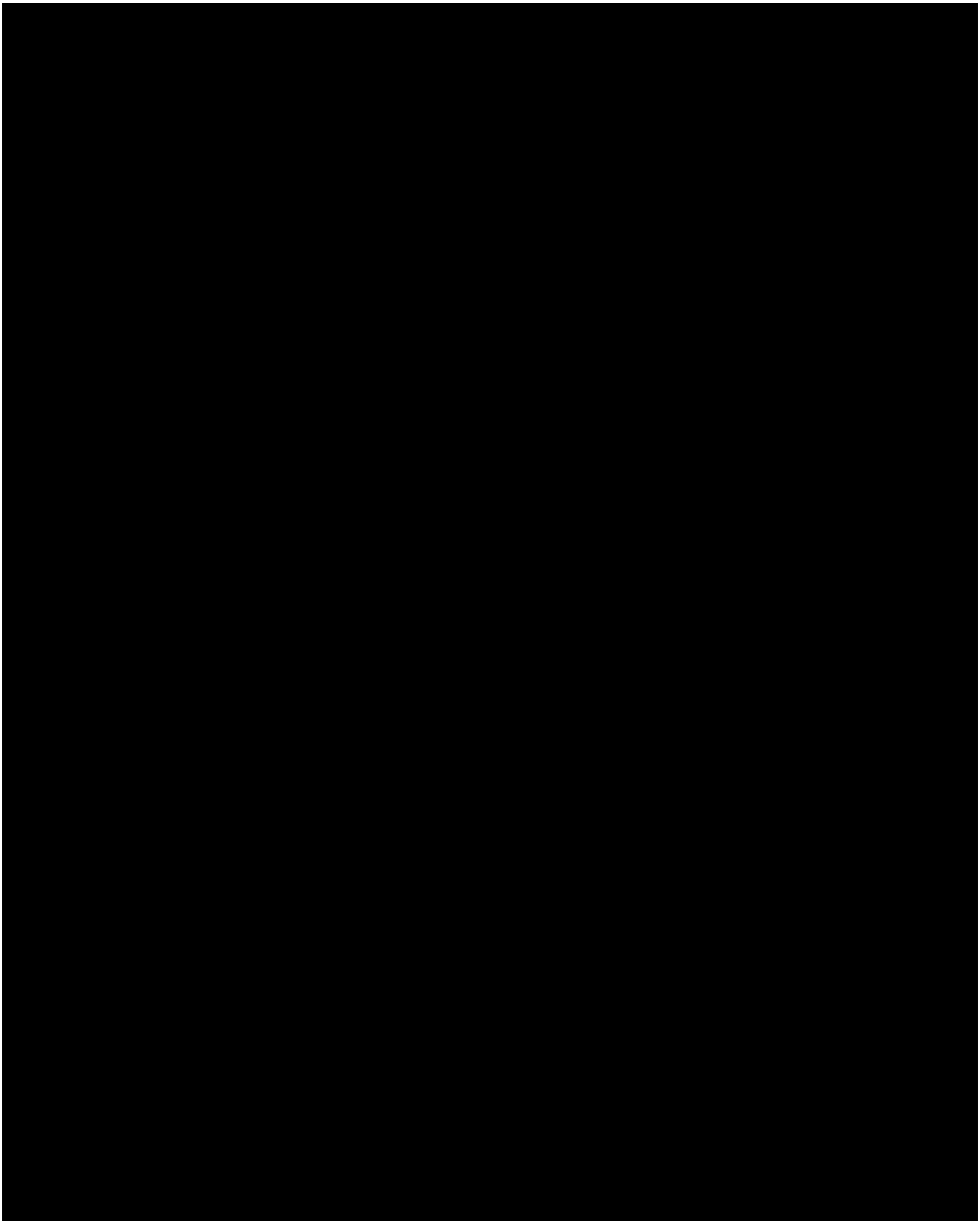




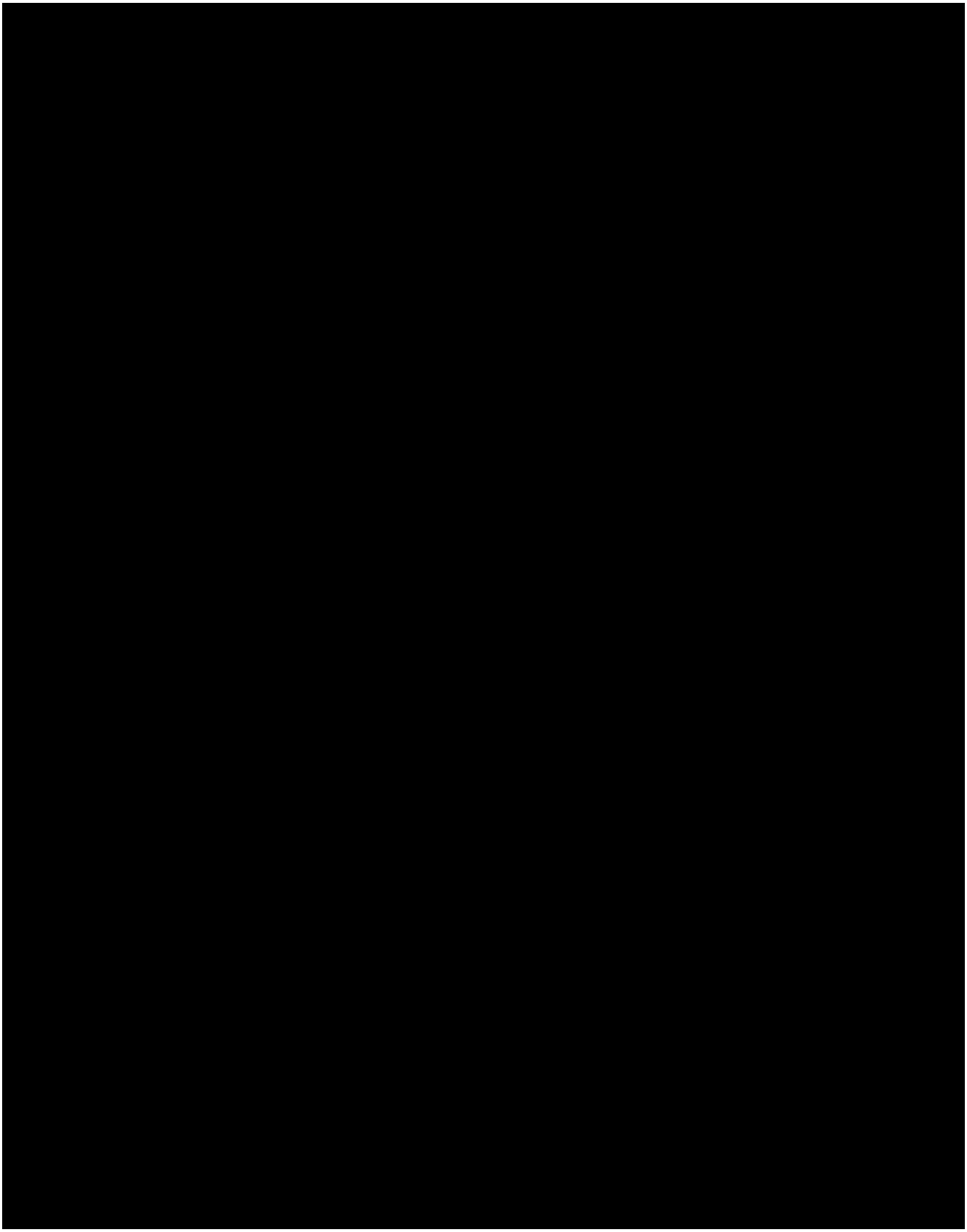


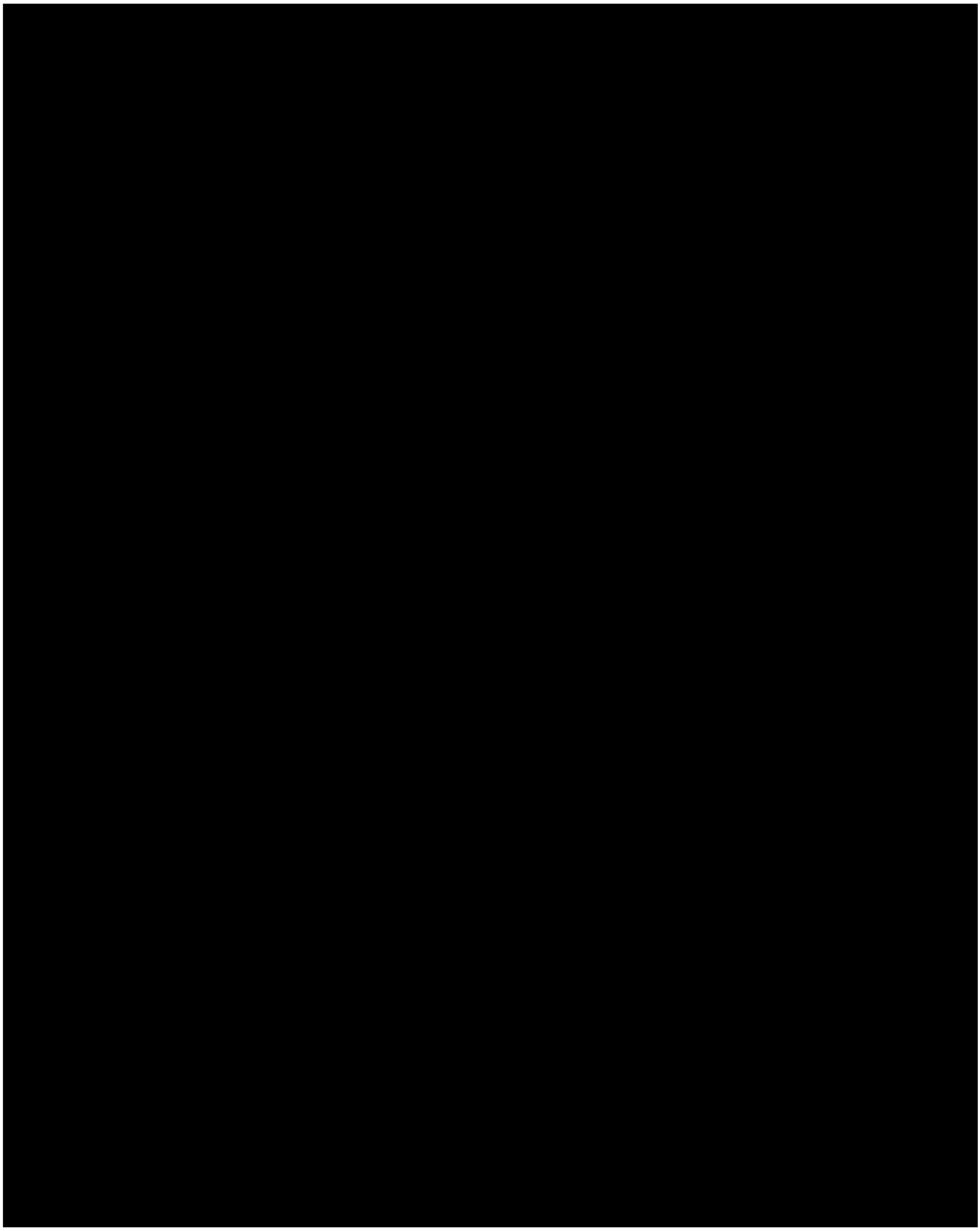


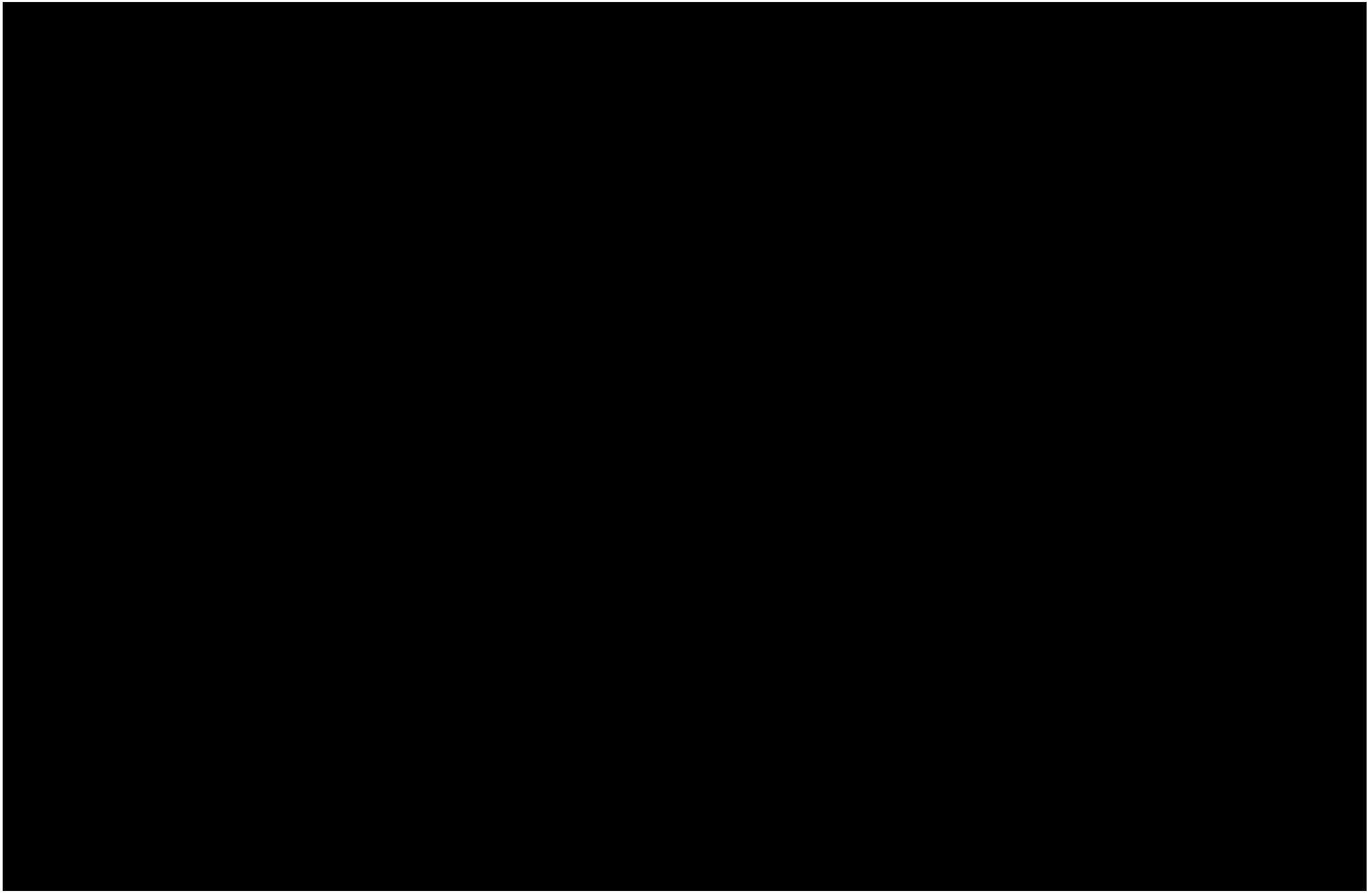


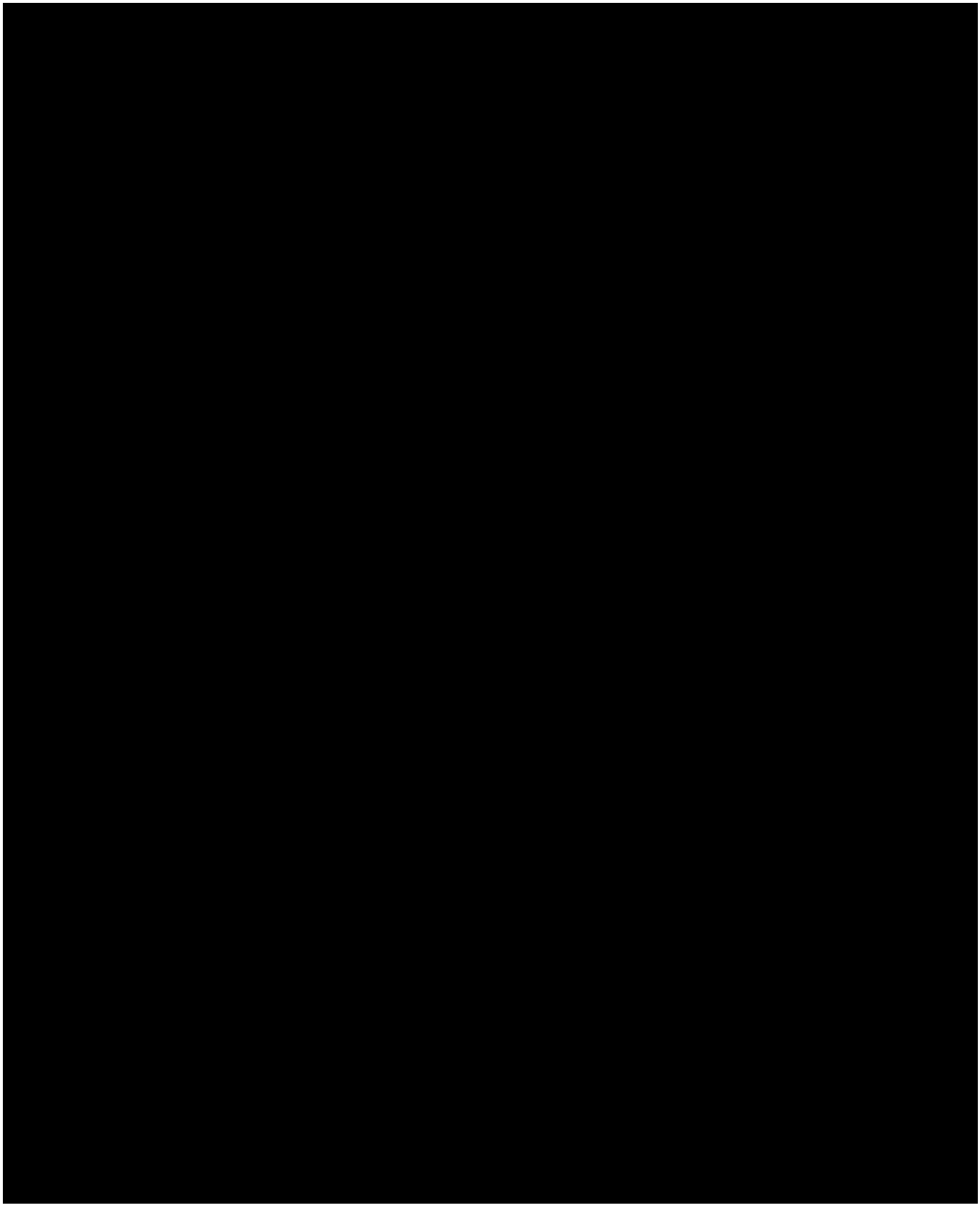


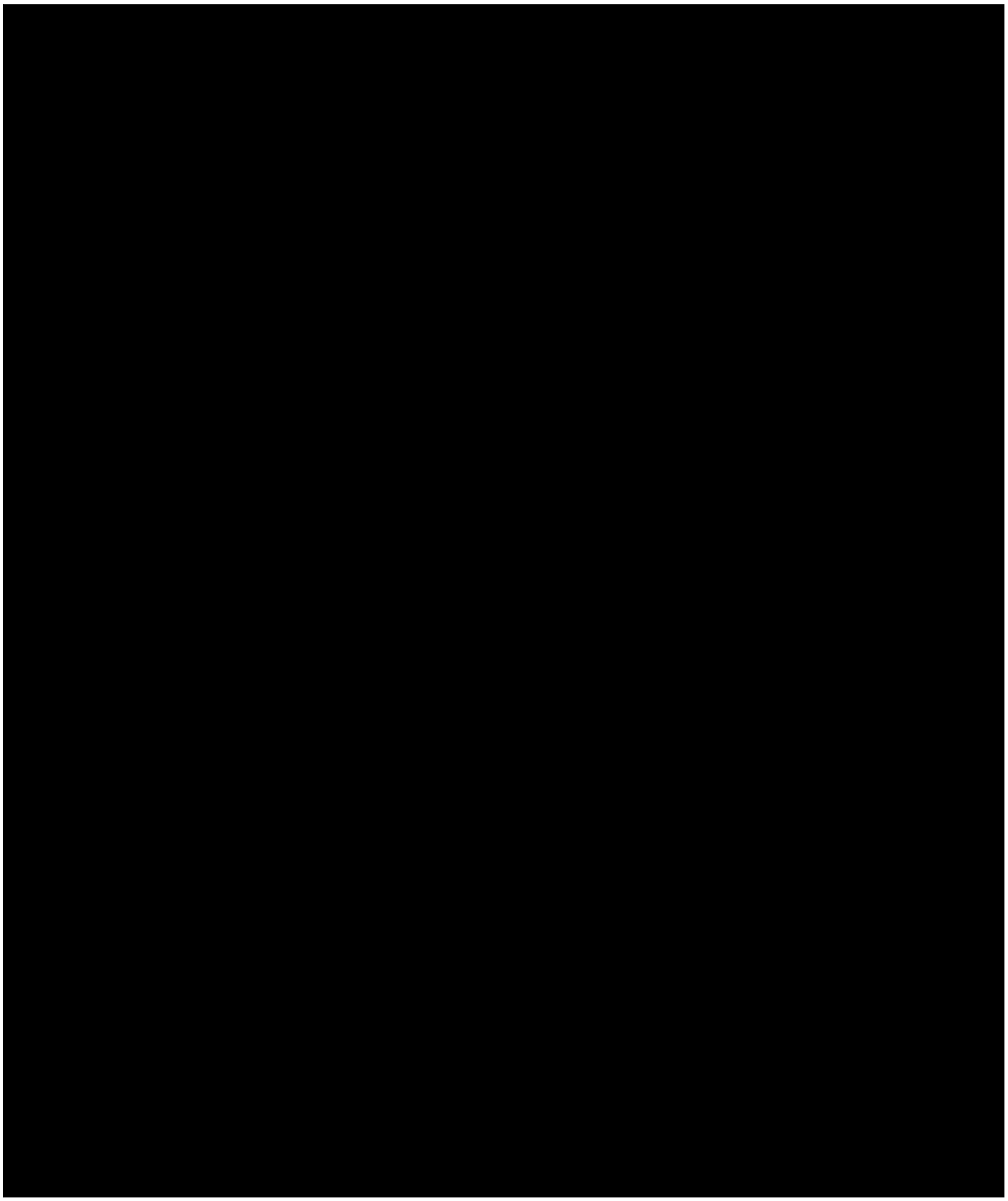
7 No-Build Demand Forecasts for Three Land Use Scenarios

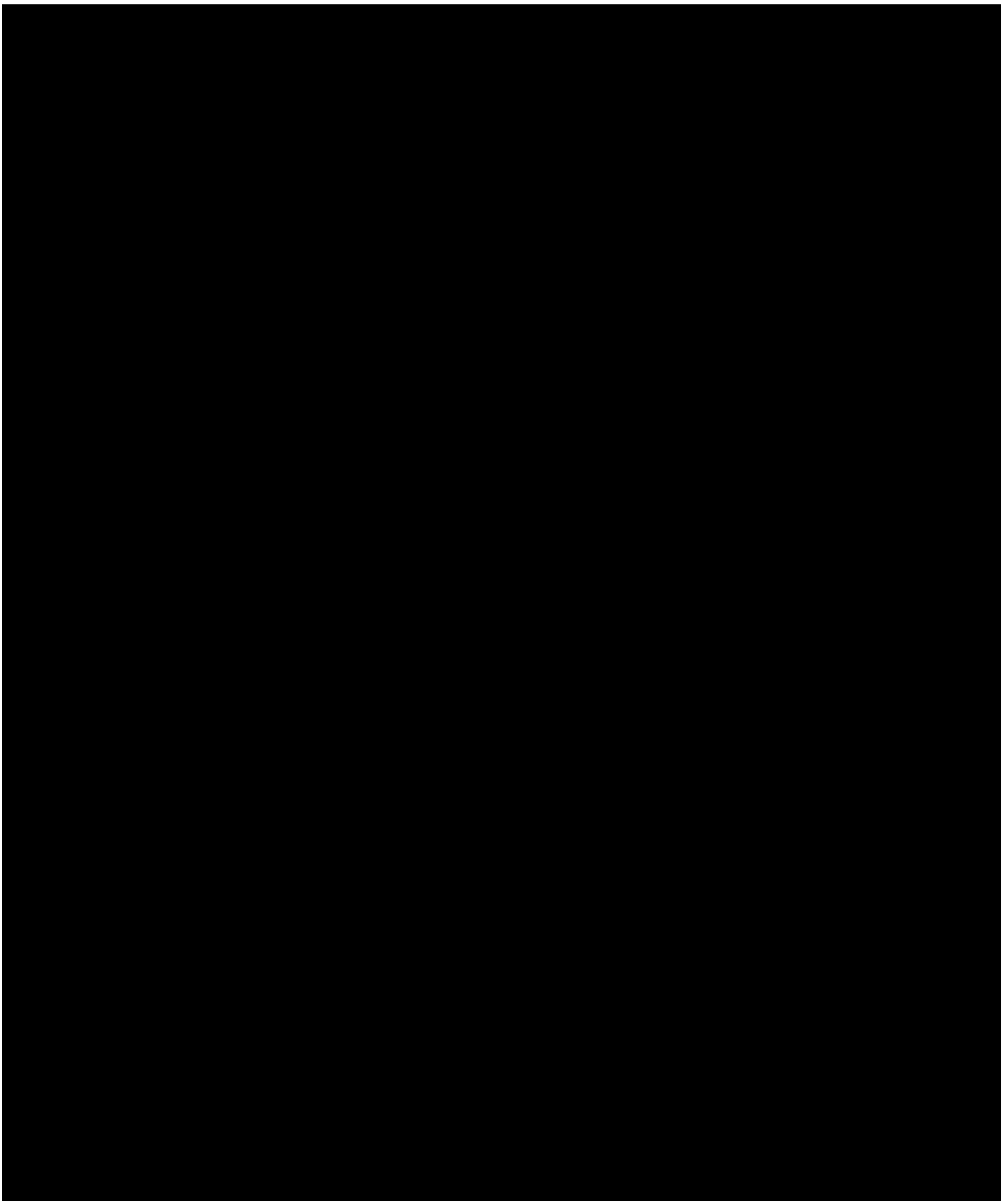


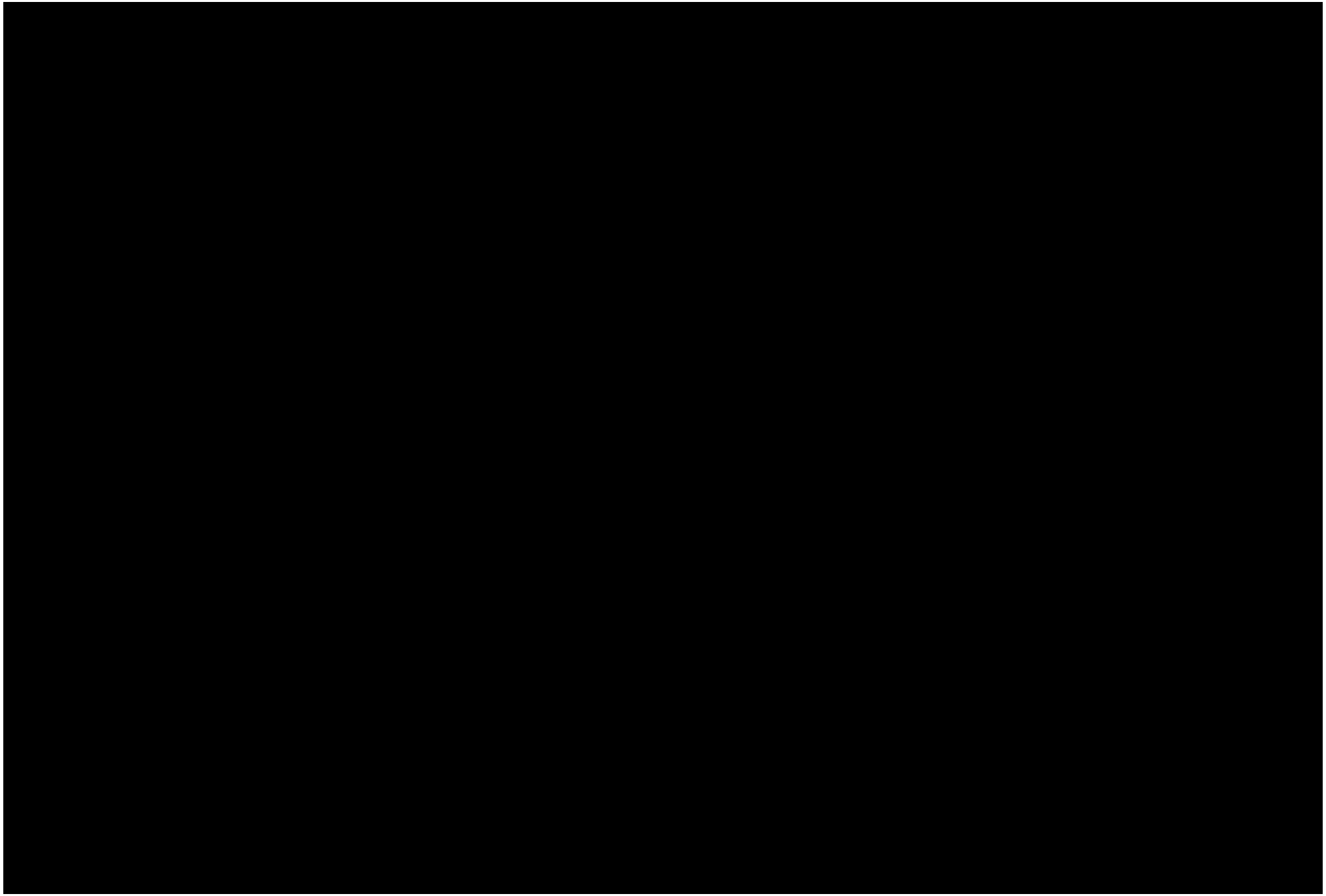


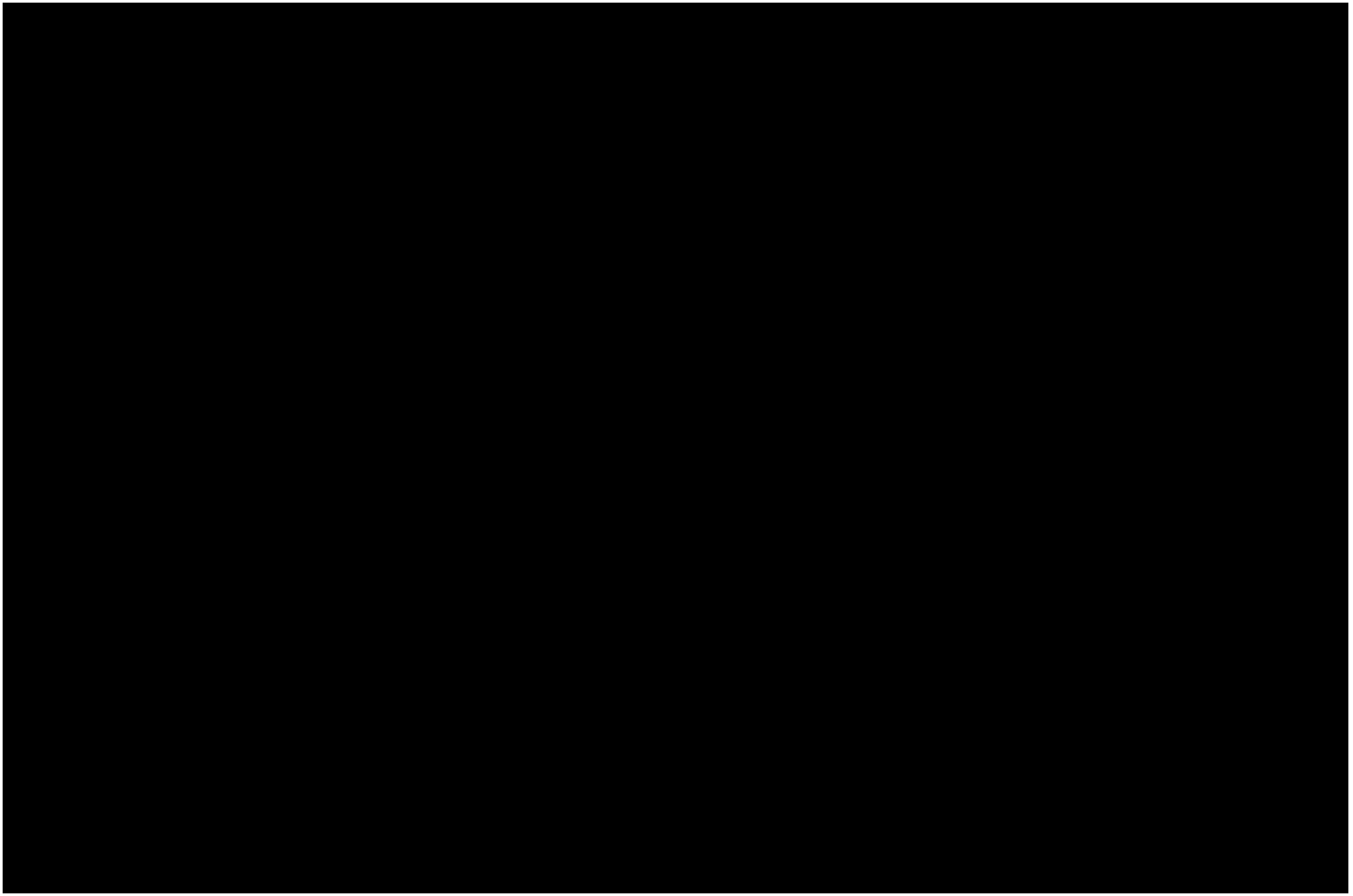


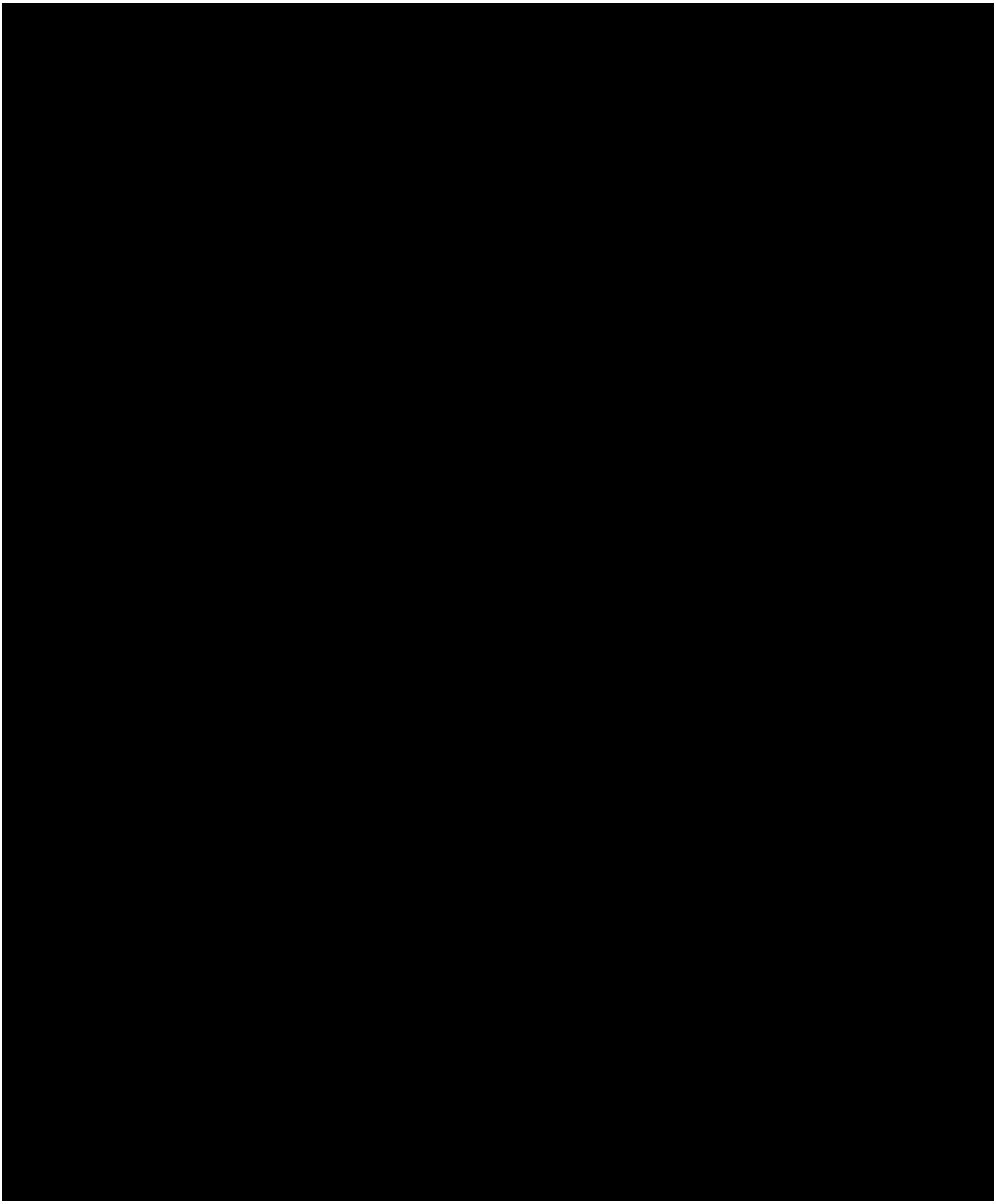


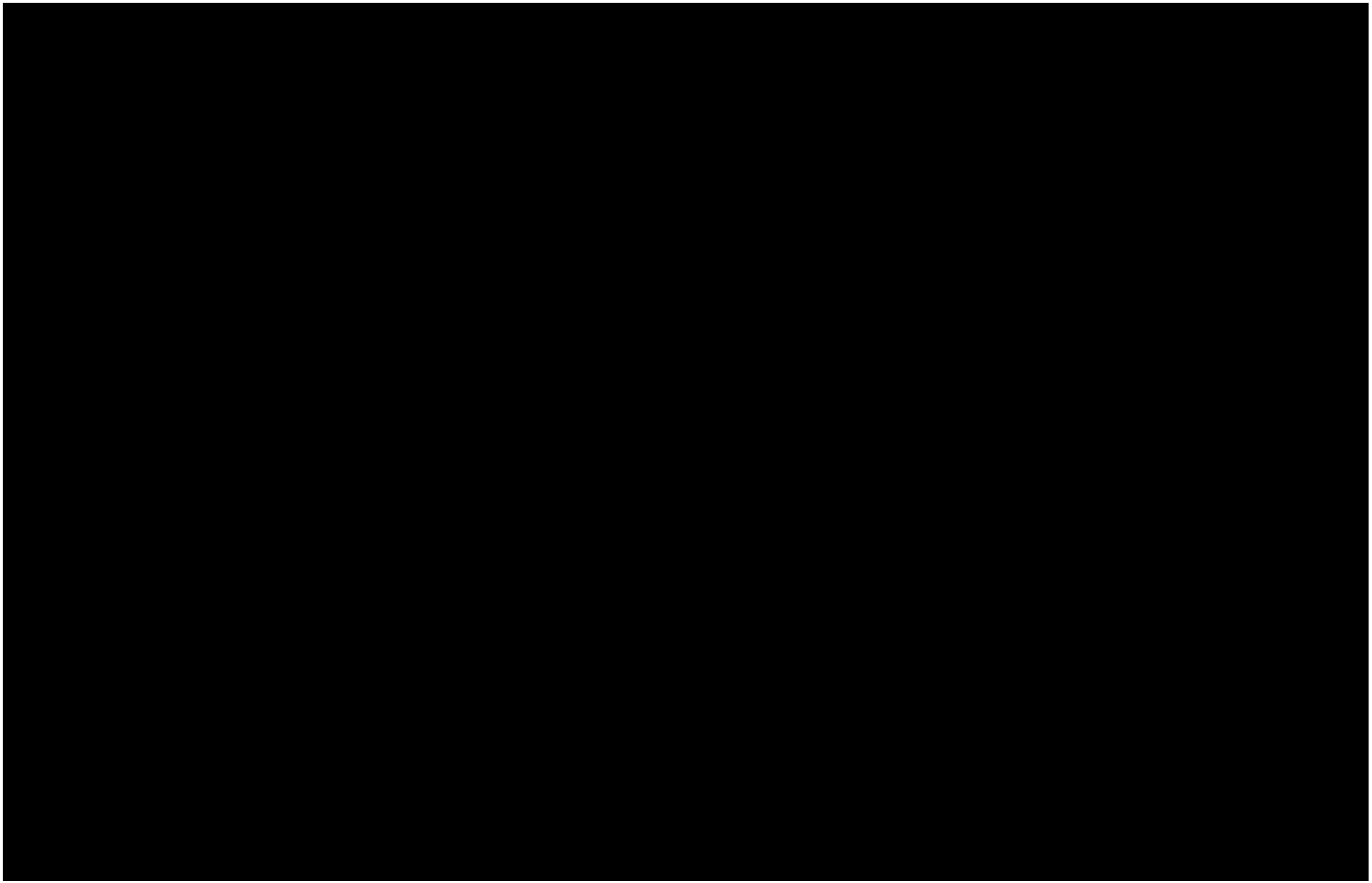


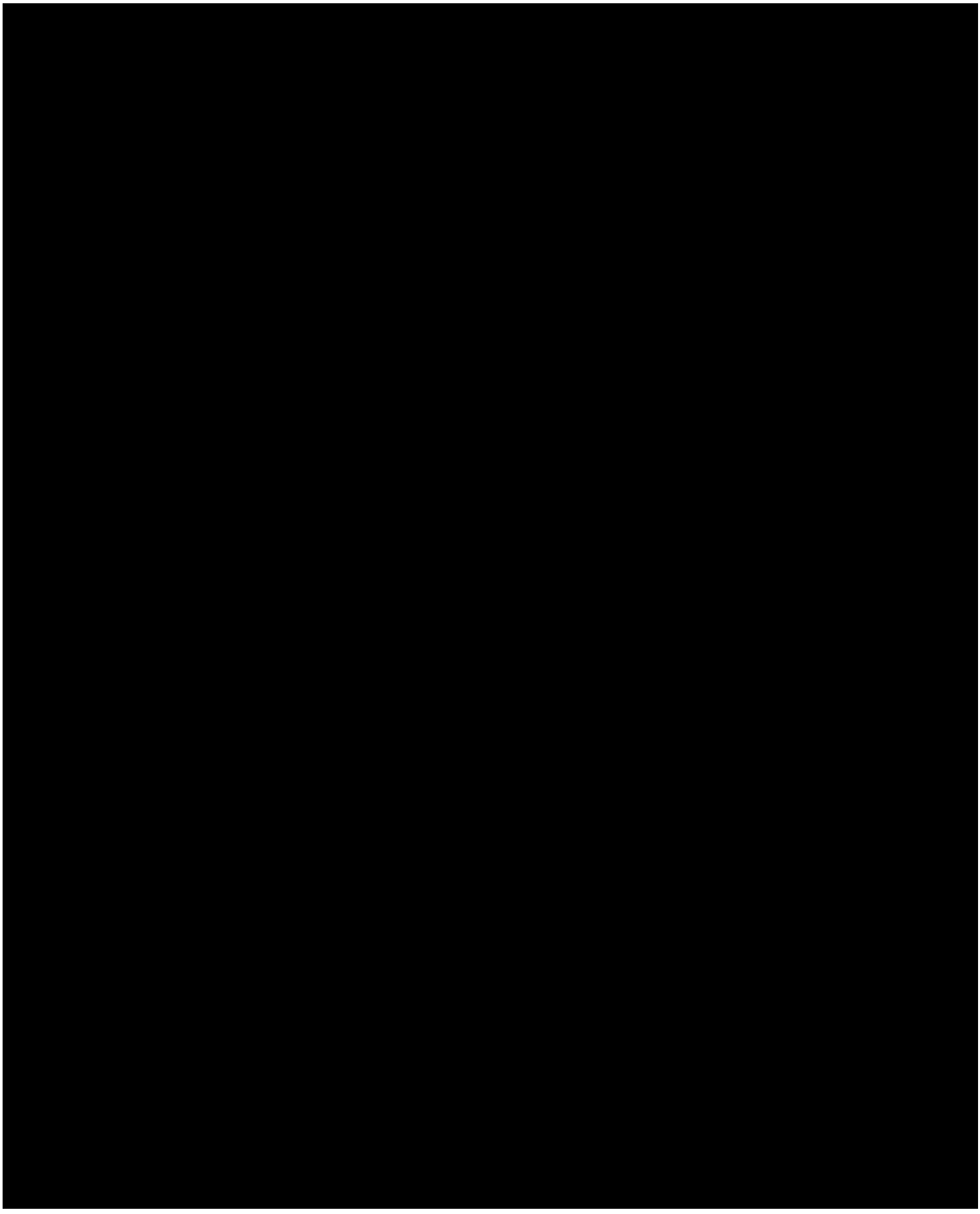


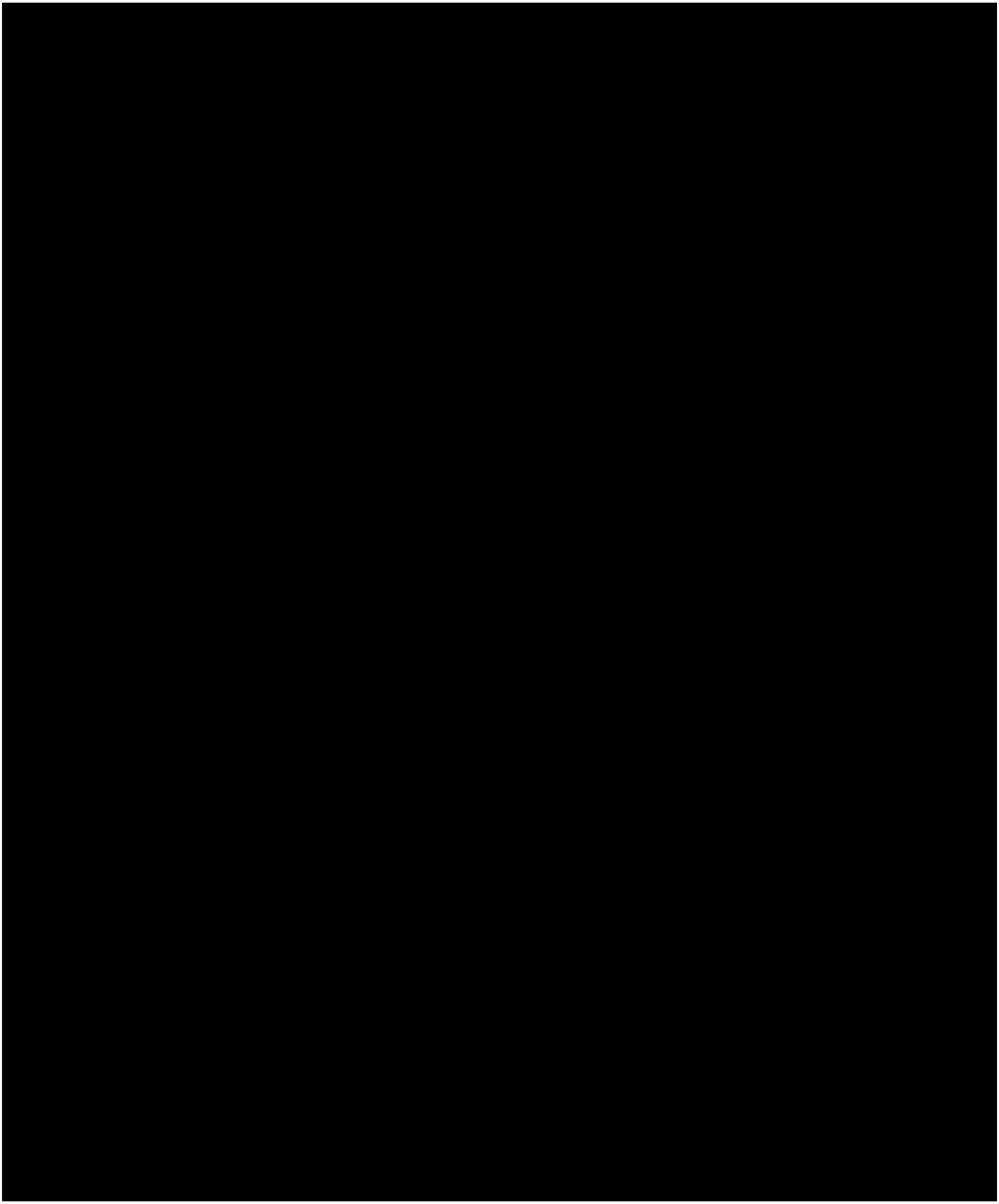












Appendix 2: Land Use Subarea Descriptions from NYC DCP

The following Land Use Subarea descriptions were provided by DCP during the 6/3/19 Land Use & Development Working Group Meeting (and accompany the map shown on Figure 4 in the main body of this report):

- **Opportunity Residential Area** - Residential area near transit. An existing low- to mid-scale residential area within .5 mile of existing A C and 3 4 subway lines. The character is a mix of one- and two- family homes as well as multi-family apartment buildings. Under existing conditions, the higher densities concentrate around the subway lines, south of Atlantic Avenue and north of Eastern Parkway. This area has potential for further density with increased transit access along Utica Avenue. The vision for these areas is to reinforce existing residential character, by allowing greater density for housing, including affordable housing.
- **Transit Corridors** - Existing and future transit corridors. The existing character along Utica Avenue is a mix of low-scale local retail, auto oriented, and heavy commercial uses, reflective of uses that are allowed by zoning today. The major east-west commercial corridors within the Study Area include Fulton Street, Church Avenue, Flatbush Avenue, and East 98th Street. These corridors have an existing low-scale local retail and residential character and function as commercial corridors for the surrounding residentials areas. Improved transit along the Utica Avenue corridor would create an opportunity for new mid- to high-density residential and commercial uses on the Utica Avenue corridor and select east-west corridors.
- **Mixed Use Corridors** - The majority of east-west avenues remain low-density residential much like the surrounding midblocks. With improved transit, the introduction of a mix of commercial and residential uses are appropriate along avenues with greater densities at key wide east-west avenues such as Atlantic Avenue, St. Johns Place, Eastern Parkway, Empire Boulevard, Lefferts Avenue, Lenox Road, Clarendon Road, and Avenue J.
- **Industrial Business Zone (IBZ)** - The existing Flatlands/Fairfield IBZ has active auto, distribution, and warehouse uses with low-scale one-story warehouses and large loading and storage yards. With improved transit access and an increase in active industrial and commercial uses at greater densities, the IBZ has the potential to become a higher density, local employment center.
- **Commercial Waterfront Area** - This area is predominated by commercial uses with the Kings Plaza Mall occupying most of this area. As a potential transit terminus, this area has potential to be transformed into a higher density commercial district with waterfront access.
- **Institutional Node** - There are existing educational and medical community facility uses clustered to the west of Utica Avenue between Winthrop and Lenox Avenues, extending west towards the 2 5 subway lines. The existing character is low-scale residential and with community facility uses. Under existing transit conditions, this institutional cluster has been identified as an opportunity area for expansion of the existing educational and community facilities as well as the introduction of commercial and residential uses at higher densities. With improved transit along Utica Avenue and increased density in both this area and along the corridor, this cluster has potential to expand as an educational and employment hub.